Calculus Warm Up #12-2

1) find $\frac{dy}{dx}$

$\sin(x + y) = x$

2) solve for x

$\sqrt{2x} = \sin(\arccos\sqrt{x})$

Calculus Warm Up #12-2

1) find $\frac{dy}{dx}$

$\sin(x + y) = x$

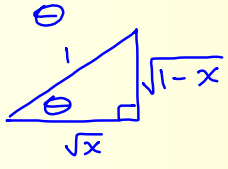
$\cos(x+y)\left(1+\frac{dy}{dx}\right) = 1$

$1 + \frac{dy}{dx} = \frac{1}{\cos(x+y)}$

$\boxed{\frac{dy}{dx} = \sec(x+y) - 1}$

2) solve for x

$\sqrt{2x} = \sin(\arccos\sqrt{x})$



$\sqrt{2x} = \sin\theta$

$\sqrt{2x} = \sqrt{1-x}$; $0 \le x \le 1$

$2x = 1 - x$

$3x = 1$

$\boxed{x = \frac{1}{3}}$

HW Questions: p. 693

In Exercises 1–10, find dy/dx and d^2y/dx^2, and evaluate each at the specified value of the parameter.

	Parametric equations	*Point*
1.	$x = 2t,\ y = 3t - 1$	$t = 3$
3.	$x = t + 1,\ y = t^2 + 3t$	$t = -1$
5.	$x = 2\cos\theta,\ y = 2\sin\theta$	$\theta = \frac{\pi}{4}$

7. $x = 2 + \sec\theta,\ y = 1 + 2\tan\theta \qquad \theta = \frac{\pi}{6}$

$\frac{dy}{dx} = \frac{2\sec^2\theta}{\sec\theta\tan\theta}$

$\frac{dy}{dx} = \frac{2\sec\theta}{\tan\theta}$

$\frac{dy}{dx} = \frac{\frac{2}{\cos\theta}}{\frac{\sin\theta}{\cos\theta}}$

$\boxed{\frac{dy}{dx} = 2\csc\theta}$

When $\theta = \frac{\pi}{6}$

$\frac{dy}{d\theta} = 2\csc\frac{\pi}{6}$

$= 2\left(\frac{2}{1}\right) = \boxed{4}$

$\frac{dy}{dx} = 2\csc\theta$

$\frac{dx}{d\theta}$

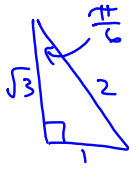
$\frac{d^2y}{dx^2} = \frac{-2\csc\theta\cot\theta}{\sec\theta\tan\theta}$

$= -2\cot^3\theta$

When $\theta = \frac{\pi}{6}$

$\frac{d^2y}{dx^2} = -2(\sqrt{3})^3$

$= -6\sqrt{3}$



9. $x = \cos^3\theta,\ y = \sin^3\theta \qquad \theta = \dfrac{\pi}{4}$

$y = (\sin\theta)^3$

$$\frac{dy}{dx} = \frac{3(\sin\theta)^2(\cos\theta)}{3(\cos\theta)^2(-\sin\theta)}$$

$$\frac{dy}{dx} = -\frac{\sin\theta}{\cos\theta}$$

$$\frac{dy}{dx} = -\tan\theta$$

When $\theta = \frac{\pi}{4}$

$$\frac{dy}{dx} = -\tan\frac{\pi}{4}$$

$$= \boxed{-1}$$

In Exercises 11–16, find an equation of the tangent line to the curve at the specified value of the parameter.

Parametric equations	*Point*
11. $x = 2t,\ y = t^2 - 1$	$t = 2$
13. $x = t^2 - t + 2,\ y = t^3 - 3t$	$t = -1$
15. $x = 2\cot\theta,\ y = 2\sin^2\theta$	$\theta = \dfrac{\pi}{4}$

In Exercises 19–28, find all points (if any) of horizontal and vertical tangency.

19. $x = 1 - t$
$y = t^2$

21. $x = 1 - t$
$y = t^3 - 3t$

23. $x = 3\cos\theta$
$y = 3\sin\theta$

$\frac{dy}{dx} = \frac{2t}{-1} \rightarrow 2t = 0$

$t = 0$

$x = 1$

$y = 0$

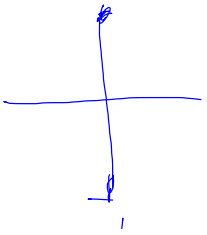
horiz tangent $(1, 0)$

No vertical tangent

$\frac{dy}{dx} = \frac{3\cos\theta}{-3\sin\theta} \rightarrow$ horiz tangent

$\cos\theta = 0$

$\theta = \frac{\pi}{2} + \pi n$



$(0, 3)$ $(0, -3)$

25. $x = 4 + 2\cos\theta$
$y = -1 + \sin\theta$

27. $x = \sec\theta$
$y = \tan\theta$

HW: finish AP WS # 8

(Pink)

8 can be turned in tomorrow for +1 EC, or due Monday after break.

Answers posted tonight.

AP Rev. #8

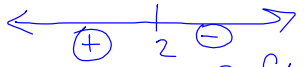
1a) f' is decreasing on $1.7 < x < 1.9$ so f'' is negative. f will be concave down.

b) Check endpts & where $f' = 0$ to justify answer • $x = \sqrt{\pi}$

2a) $f'(22) = -3$ Cal/min^2

b) Looking for max of f'

use $f''(t) = -\frac{3}{2}t + 3$ → f''



confirms max of f' @ $t = 2$

3b) $c = 1$

5a) $g'(0) = a - 4$

$g''(0) = a^2 + 3$

b) $h'(x) = f'(x)\cos kx - k\sin kx$

slope $= h'(0) = -4$

pt of tangency $(0, 2)$

$\boxed{y = -4x + 2}$